Introduction to Databases

Summer term 2007

Tutorial Session „0“

Outline

- Some Organizational Notes
- „My Personal Database Literature Favourites“
- Some Short ER Remarks
- Modeling hierarchy
- Some ER Modelling Extensions
  - Weak entities
  - Higher-degree relationships
- Database Terminology

Course Tutorials

- Date/Place:
  - Monday: 11.45 - 13.15, AH VI  start: April 23
- New exercise sheets are available online or distributed during the tutorial session
- Hand in after one week
- Presentation of correct solutions in the following week
- Exceptions from this schedule will be announced
- Homework can (and should) be done in groups of up to 3 students

Requirements for Certificate

- To obtain a certificate for the exercises/homework to the course Introduction to Databases Systems all of the following requirements must be fulfilled:
  - Score at least 50% of the overall points for the homework/exercises
  - Active participation in tutorials (presentation/conversation)
  - Score at least 50% in the written exam at the end of semester (Jul 18, 2007)
- Grade of Certificate depends only on the written exam
- Some study courses may have different rules
  - Has to be checked and confirmed by us!
- General Recommendation:
  Use Tutorials for self-evaluation and „motivation“ to distribute database learning over the semester!
Course Material

- Course Material is available online
- Printed copies of the course material will be distributed in multiple parts
- Vouchers are available for € 3 after lecture or from the office of Informatik V
  Mon – Fri: 9:00 – 12:30
  Tue + Thu: 14:00 – 17:00
- Copies of the course material can also be obtained at the office of Informatik V

Online Course Material

Linked from the lecture homepage
http://www-i5.informatik.rwth-aachen.de/lehrstuhl/lehre/EDB07/index.html

User Name: edb07User
Password: BoyceCodd

Consider buying our printed copies (3€)
- Material contains “blank slides” that have to be filled in during lecture
- More than 600 slides (=150 pages!

Literature
(Some Personal Recommendations)

- General
    - German Translations available; do not use the „Grundstudiums Ausgabe“
- Databases and XML
  - Georg Lausen: Datenbanken – Grundlagen und XML-Technologien, Spektrum, 2005
  - Web und Datenbanken (Konzepte, Architekturen, Anwendungen), dpunkt-Verlag, 2003
- Miscellaneous
  - M. Hitz, G. Kappel: UML @ Work -- Von der Analyse zur Realisierung, dpunkt-Verlag, 1999
    (besides many others…)

Some Short ER Remarks

- Conceptual Modelling vs. Physical Modelling
  - CM: Do not consider how DB is (or will be) realized
  - A Conceptual Model should support communication with the DB’s users
- Be aware of the correct position of cardinality constraints in (min,max) and 1:n notation
  
  Continent \( \text{located} \) \( (1,n) \) \( (1,1) \) \( n \) \( 1 \) \( 0,1 \) \( 0,n \)

- Be aware of different expressivity of (min,max) and 1:n
  - How to constrain minimal number of participating entities in 1:n notation?

  Do not forget to switch the sides!
**Instances and Types**

- ER-Diagram depicts conceptualisation of the domain in terms of Entity-Types and Relationship-Types

  ![ER-Diagram](image.png)

- Informal notation for instances:

  ![Diagram](image.png)

**Instances, Models and Metamodels**

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**Weak entities (I)**

- Example of geographical DB:

  ![Diagram](image.png)

- Regions in different countries can have the same name, Cities in different regions can have the same name.

- What to use as keys for entity types Region and City?
  - Assumption: System-generated ID is not available

- Idea: Bind existence of entity to entity of another type and identify entity by its partial key and the owner’s key

**Weak entities (II)**

- Implies total participation constraint (opposite direction is not always true)

- Think of using a multi-value composite attribute as an alternative!

- Note: Similar to composition construct in UML
Higher-Degree relationships

Motivation

- So far: Binary relationship types: One Entity type is related to another one
- Consider course schedule DB:

  ![Diagram of Course, Instructor, Semester relationship]

  Information that a particular course is held by an instructor in a particular semester can be most naturally understood as a ternary relationship

Higher-Degree relationships

Cardinality constraints (I)

- Extend cardinality ratios (1:n notation):

  ![Diagram of cardinality constraints (I)]

  \( x \): How many \( B \) instances are related to one \( A \) instance?

  \( x \): How many \( B \) instances are related to one \( (A,C) \)-instance pair?

Higher-Degree relationships

Cardinality constraints (II)

- Extend (min,max)-notation:

  ![Diagram of cardinality constraints (II)]

  \( x \): In how many \( r \) instances is one \( B \) instance involved in?

  = How many \( A \) instances are related to one \( B \) instance?

  \( x \): In how many \( r \) instances is one \( B \) instance involved in?

  = How many \( (A,C) \) instance pairs are related to one \( B \) instance?

Higher-Degree Relationships Course, Instructor, Semester example

- Note:
  - Different “notations” have different expressivity
  - Sometimes used in parallel